Topic : Newton Raphson Method - Roots of Equations
Simulation : Pitfall - Zero slope
Language : Mathcad 2001
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Date : 28 June 2002
Abstract : This simulation illustrates a pitfall of zero slope in the Newton-Raphson method of finding roots of f(x)=0.

INPUTS: Enter the following

Function in f(x)=0 $f(x) := \sin(x)$

Range of x you want to see the function $x := -10, -9.99 .. 10$

Initial guess $x_{initial} := \frac{\pi}{2}$

SOLUTION:

$$g(x) := \frac{d}{dx} f(x)$$

In the following example, a zero slope is encountered. As the tangent line parallels the x-axis, convergence will not occur.

Notice that our first guess has a zero slope, which causes division by zero in the N.R. formula, and hence an error in our calculation (note the "singularity" error message, and the undefined x1).

Iteration 1

$x_0 := x_{initial}$

$x_0 = 1.571$

$$x_1 := x_0 - \frac{f(x_0)}{g(x_0)}$$

$x_1 =$

$\tan(x) := g(x_0) \cdot x + \left(f(x_0) - g(x_0) \cdot x_0\right)$

Function entered and tangent line of the curve at the current guess